

REMARKS

Support for newly added claims 11 and 12 can be found in the specification at page 3, lines 1-6. The Examiner has rejected claims 1-10 as being unpatentable over U.S. Patent No. 3,526,654 to Hilderbrand et al. ("Hilderbrand"). The applicant respectfully traverses this rejection.

Hilderbrand relates to the isomerization of cis-2-pentenitrile to trans-3-pentenitrile at from 25 to 500°C in the gas or liquid phase in the presence of aluminum oxide (column 1 lines 60 to 67). The Al₂O₃ catalyst should be in porous or fine distribution in order to bring about a large surface area (column 2 lines 1 to 7). However, Hilderbrand does not disclose BET surface area of at least 50 m²/g, as is required by the applicant's claimed invention.

Hilderbrand is cited in the applicant's specification at page 1, lines 17-30 which state:

US 3,526,654 discloses the isomerization of cis-2-pentenitrile to trans-3-pentenitrile in the presence of silicon dioxide, aluminum oxide or sodium calcium silicate catalysts which may be present in various modifications, in the liquid or gas phase at temperatures in the range from 25°C to 500°C. **Example 3 describes the isomerization mentioned over aluminum oxide at room temperature in the liquid phase, and a conversion of 40% was observed after 6 months. However, this reaction time is uneconomic for an industrial process.**

Typically, the reaction rate can be increased by raising the reaction temperature. This measure is not suitable for the purpose in the present isomerization of cis-2-pentenitrile to trans-3-pentenitrile, since, in the case of pentenenitriles, **an increase in the reaction temperature within the temperature range disclosed in US 3,526,654 is known to lead to the formation of an industrially unacceptably high amount of oligomers and polymers.** (emphasis added)

The applicant's claimed invention requires that the aluminum oxide has a BET surface area of at least 50 m²/g and the reaction is carried out at a temperature in the range of from 50°C to 250°C. It is acknowledged that Hilderbrand discloses a temperature range of 25 to 500°C, but Hilderbrand does not recognize the advantage of having (1) the aluminum oxide has a BET surface area of at least 50 m²/g and (2) the reaction is carried out at a temperature in the range of from 50°C to 250°C.

The disclosure of Hilderbrand is very broad. There are several types of catalysts that can be used besides aluminum oxide. There is very large temperature range that can be used (25 to 500°C). There are four examples in Hilderbrand. Examples 2 and 4 use a catalyst outside the scope of the applicant's claimed invention (example 2 uses SiO₂ while example 4 uses Aluminosilicate). Only examples 1 and 3 use an aluminum oxide catalyst. Example 3 is the only example using the catalyst in the liquid phase (see the applicant's claims 4, 6 and 12). Hilderbrand's Example 3 works in the presence of η -Al₂O₃ at 25°C in the liquid phase, the reaction time being 6 months compared to the 7 hours in the applicant's specification. Example 3 is outside the applicant's claimed invention because the reaction temperature (25 °C) is half the minimum temperature claimed by the applicant 50°C. One skilled in the art would have to do several manipulations in Hilderbrand to arrive at the applicant's claimed invention. A person of ordinary skill in the art would first have to select the correct catalyst (aluminum oxide). Next, the person of ordinary skill in the art, would have to select an aluminum oxide catalyst that has a BET surface area of at least 50 m²/g. Hilderbrand does not disclose this range. Lastly, a person of ordinary skill in the art would carry out the reaction at a temperature in the range of from 50°C to 250°C. There would be no reason for a person of ordinary skill in the art to make all these selections.

Below is a table which shows the working examples of the present invention and a comparison using a catalyst with a lower BET surface area than claimed by the applicant. The results of using an aluminum oxide catalyst having a BET at least 50 are unexpectedly superior to an aluminum oxide catalyst having a surface area BET of 31.5 (see Σ 3-PN %).

Examples	Phase	Catalyst ¹⁾	Reaction effluent from isomerization				Σ 3-PN [%]	Σ 2-+3 PN [%]	Obligomers [%]	Remarks
			2-PN [%]		3-PN [%]					
			cis	trans	cis	trans				
Comp. Exp. 1	liquid	31.5	94.06	0.75	0.7	2.97	3.67	98.48	0	Batchwise experiment with 10% weight Al ₂ O ₃ . Standard pressure, reflux.1
1	liquid	72	70.25	15.07	2.17	10.96	13.1	98.45	0	
2	liquid	106	57.24	19.95	3.23	17.89	21.12	98.3	0.17	
3	liquid	250	56.04	19.18	3.12	19.27	22.3	97.6	0.84	
4	liquid	349	39.3	34.1	5.1	18.5	23.6	97.0	1.4	

1) Al₂O₃ with different BET surface areas (m²/g)

The reaction time was 7 hours for all examples and the reaction temperature was from 126-144°C.

It is noted that all the data in the table appears in Table 1 of the specification. The Σ 3-PN (the sum of the 3-pentenitrile) and Σ 2-+ 3PN (the sum of the 3-pentenitrile and the 2- pentenitrile) can easily be calculated from the table. For example, using the comp. Exp 1, Σ 3- PN is $0.7 + 2.97 = 3.67$ and Σ 2- + 3-PN is the total of 2-PN ($94.06 + 0.75$) + the total for Σ 3-PN (3.67) = 98.48

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 12810-00152-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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